DOCUMENT RESUME

ED 326 651 CE 056 397

TITLE Competency Reference for Computer Assisted Drafting.
INSTITUTION Oregon State Dept. of Education, Salem. Div. of Vocational Technical Education.
PUB DATE 90
NOTE 14p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)
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EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Behavioral Objectives; *Competence; *Competency Based Education; *Computer Assisted Design; *Drafting; Graphic Arts; Postsecondary Education; Secondary Education; State Standards
IDENTIFIERS Oregon

ABSTRACT

This guide, developed in Oregon, lists competencies essential for students in computer-assisted drafting (CAD). Competencies are organized in eight categories: computer hardware, file usage and manipulation, basic drafting techniques, mechanical drafting, specialty disciplines, three dimensional drawing/design, plotting/printing, and advanced CAD. Each of the four to eight competencies in each category includes a competency statement that describes the performance standard required to demonstrate proficiency in that skill. (KC)

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Competency Reference for Computer Assisted Drafting

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1990 ACKNOWLEDGMENTS

The development of computer assisted drafting competency curriculum is based on a competency-based vocational education system implemented by teachers, administrators, and business representatives striving for excellence in the field of computer assisted drafting and piloted by the Clackamas Vocational Technical Education Consortium (CVTEC). Sections of CVTEC's work have been implemented in this document.

The Department of Education would like to thank the following individuals for their contributions in the development of computer assisted drafting curriculum.

La Monine Bennett, Clackamas High School
Neal Ehlen, Rex Putnam High School
Andy Espino, West Linn High School
Marilyn Davis, ODE-DVTE, Program Operations-Director
Larry Hansen, Molalla High School
Patricia Hindman, Clackamas ESD, Regional Coordinator
Claudia Leppert, ODE-DVTE, Curriculum Specialist
David Madsen, Clackamas Community College
Bob Palioca, KETIV Technologies, Inc.
Wayne Palioca, KETIV Technologies, Inc.
Doug O'Brien, Milwaukie High School
Ed Romero, Canby High School
Terrance Shumaker, Clackamas Community College
Bob Williams, Oregon City High School
Don Sligar, ODE-DVTE, Occupational Specialist

Further local industry validation should be used when selecting the competencies for use.

This document does not attempt to recognize all competencies required for drafting training, but focuses on the competencies essential to the introduction of CAD into the drafting curriculum. Competencies specific to different needs and applications of drafting can be incorporated into the CAD environment using this guide to CAD competencies.

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COMPUTER AIDED DESIGN/DRAFTING
COMPETENCY GUIDELINES

1.0 COMPUTER HARDWARE

1.1 COMPETENCY: Identify components of a computer-aided drafting (CAD) workstation.

Competency Statement

Given the physical hardware or reference materials, identify the minimum number of components required for a computer-aided drafting (CAD) workstation.

1.2 COMPETENCY: Start up and shut down of a microcomputer CAD system.

Competency Statement

Given the physical hardware of a CAD workstation, start up and shut down a microcomputer CAD system so that all equipment functions properly without any errors or failures.

1.3 COMPETENCY: Operate a digitizer tablet with a CAD program.

Competency Statement

Given a CAD workstation and digitizer tablet with either a stylus or puck, operate the digitizer tablet with a CAD program to successfully draw an object using drawing and editing commands.

1.4 COMPETENCY: Operate a printer.

Competency Statement

Given a microcomputer and a printer, operate the printer so that a printed copy of a file or program is produced.

1.5 COMPETENCY: Operate a pen plotter.

Competency Statement

Given a CAD workstation and pen plotter, operate the pen plotter to produce a plotted drawing in felt tip pen or wet ink that is positioned properly inside the edges of the paper and sized to a specified scale.

1.6 COMPETENCY: Identify, define, and operate the features and controls of a monitor.

Competency Statement

Given a computer monitor, identify, define, and operate the features and controls of the monitor so that all controls and features are covered with 100 percent accuracy.

1.7 COMPETENCY: Identify and use the components of a microcomputer keyboard.

Competency Statement

Given a microcomputer keyboard, identify and use the components of a microcomputer keyboard to satisfy the requirements of the CAD program.

2.0 FILE USAGE AND MANIPULATION

2.1 COMPETENCY: Load a program from a flexible or hard disk drive.

Competency Statement

Given a CAD workstation and reference materials, load a program from a flexible or hard disk drive so that the program functions according to its specifications.

2.2 COMPETENCY: Prepare blank flexible disks for use.

Competency Statement

Given a CAD workstation and reference materials, prepare blank flexible disks for use so that files can be stored and retrieved on the disk.

2.3 COMPETENCY: Save and retrieve drawing files from a flexible or hard disk drive.

Competency Statement

Given a CAD workstation, reference materials, and file storage specifications, save and retrieve drawing files from a flexible or hard disk drive into the correct directory so the files can be edited in the future without searching through additional directories.

2.4 COMPETENCY: Construct a directory and subdirectory on flexible or hard disk.

Competency Statement

Given a CAD workstation, reference materials, and directory naming specifications, construct a directory and subdirectory on flexible or hard disk that are located and named according to assignment and naming specifications.

2.5 COMPETENCY: Copy files.

Competency Statement

Given a CAD workstation and reference materials, copy files from one directory to another and from one disk to another without errors.

2.6 COMPETENCY: Rename files.

Competency Statement

Given a CAD workstation and reference materials, rename files within a directory or on a disk, according to naming specifications without errors.

2.7 COMPETENCY: Delete files.

Competency Statement

Given a CAD workstation and reference materials, delete files from the assigned directory or disk without errors.

3.0 BASIC DRAFTING TECHNIQUES

3.1 COMPETENCY: Plan, lay out, and use prototype drawings.

Competency Statement

Given a computer, CAD program, and drawing specifications or sketches with at least three different drawing types and scale requirements, plan, layout, and use prototype drawings. The prototype drawings will allow the student to set up the drawing without any modifications or corrections.

3.2 COMPETENCY: Construct a multi-view drawing with straight line segments and dimensions.

Competency Statement

Given a computer, CAD program, and drawing specifications or sketches, construct a multi-view drawing with straight line segments and dimensions to 100 percent accuracy using ANSI standards.

3.3 COMPETENCY: Construct a multi-view drawing with line, arc, circle entities, and dimensions.

Competency Statement

Given a computer, CAD program, and drawing specifications or sketches, construct a multi-view drawing with line arc, circle entities, and dimensions to 100 percent accuracy using ANSI standards.

3.4 COMPETENCY: Construct a drawing using at least three layers, colors, and line types.

Competency Statement

Given a computer, CAD program, and drawing specifications or sketches of an object with dimensions, construct a drawing using at least three layers, colors, and line types to 100 percent accuracy using ANSI standards.

3.5 COMPETENCY: Identify and use the digitizer tablet menu and command to complete a formal drawing.

Competency Statement

Given a computer, CAD program, digitizer tablet, tablet menu, and drawing specifications or engineering sketches, identify and use the digitizer tablet menu and commands to complete a formal drawing to 100 percent accuracy using ANSI standards.

3.6 COMPETENCY: Use editing commands and techniques to make drawing revisions and corrections.

Competency Statement

Given a computer, CAD program, drawing specifications, sketches, and requested changes, use editing commands and techniques to make drawing revisions and corrections. The revisions will be 100 percent accurate.

3.7 COMPETENCY: Apply text to a drawing.

Competency Statement

Given a computer, CAD program, and a drawing or sketches with at least three different text requirements, apply text to a drawing. The drawing will be 100 percent accurate based on the text requirements, the layout, and ANSI standards.

3.8 COMPETENCY: Draw objects using absolute, relative, and polar coordinates.

Competency Statement

Given a computer, CAD program, and a set of absolute, relative, and polar coordinates, draw objects using absolute, relative, and polar coordinates. The drawing will be 100 percent accurate.

4.0 MECHANICAL DRAFTING

4.1 COMPETENCY: Lay out the formal multi-view drawings for given objects.

Competency Statement

Given a computer, CAD program, and completely dimensioned engineering sketches of at least four different objects, lay out the formal multi-view drawings for each object. The drawings will be accurate and technically correct in accordance with ANSI standards.

4.2 COMPETENCY: Lay out the formal multi-view drawings with complete dimensions for given objects.

Competency Statement

Given a computer, CAD program, and completely dimensioned engineering sketches of at least four different objects, lay out the formal multi-view drawings with complete dimensions for each object. The drawings will be accurate and technically correct in accordance with ANSI standards.

4.3 COMPETENCY: Lay out formal multi-view drawings with complete tolerance dimensions for given objects.

Competency Statement

Given a computer, CAD program, and completely tolerance dimensioned engineering sketches of at least four different objects, lay out the formal multi-view drawing with complete tolerance dimensions for each object. The drawings will be accurate and technically correct in accordance with ANSI standards.

4.4 COMPETENCY: Draw multi-views with sections.

Competency Statement

Given a computer, CAD program, and completely dimensioned engineering sketches of at least eight different objects, with each object using a different one of the following sectioning techniques:

a. Full
b. Half

c. Aligned
d. Offset
e. Removed
f. Revolved
g. Broken-out
h. Object with thin wall section, for solid application

Draw the formal multi-view with completely dimensioned drawings for each object. The drawings will be accurate and technically correct in accordance with ANSI standards.

5.0 SPECIALTY DISCIPLINES

5.1 COMPETENCY: Identify and use specialty tablet menu.

Competency Statement

Given a CAD workstation and reference materials, identify and use specialty tablet menus according to the manufacturer's instructions and specifications.

5.2 COMPETENCY: Create a set of standard symbols for a specific discipline.

Competency Statement

Given a CAD workstation and reference materials, create a set of standard symbols for a specific discipline that are accurate according to the specifications of that discipline.

5.3 COMPETENCY: Construct a drawing using a discipline-specific prototype drawing.

Competency Statement

Given a CAD workstation, reference materials, and existing drawings, construct a drawing using a discipline-specific prototype drawing according to applicable standards for that discipline and general ANSI drawing standards.

5.4 COMPETENCY: Use existing symbols to construct nonscale and scaled drawings.

Competency Statement

Given a CAD workstation, reference materials, specialty software, use existing symbols to construct nonscale and scaled drawings to conform to applicable standards for that discipline and general ANSI drawing standards.

6.0 THREE DIMENSIONAL DRAWING/DESIGN

6.1 COMPETENCY: Construct an isometric drawing using straight line segments.

Competency Statement

Given a CAD workstation and reference materials, construct an isometric drawing using straight line segments with proper isometric angles and measurements.

6.2 COMPETENCY: Construct an isometric drawing using line, arc, and circle entities.

Competency Statement

Given a CAD workstation and reference materials, construct an isometric drawing using line, arc, and circle entities with proper isometric angles, measurements, and ellipse orientations.

6.3 COMPETENCY: Construct a true three dimensional drawing using line, arc, and circle entities.

Competency Statement

Given a CAD workstation and reference materials, construct a true three dimensional drawing using line, arc, and circle entities using accurate measurements and angles.

6.4 COMPETENCY: Design an object in 3-D.

Competency Statement

Given a CAD workstation, reference materials, and preliminary sketches, design a three dimensional object that accurately reflects the design sketch without using two dimensional views.

6.5 COMPETENCY: Display an object in any viewing plane.

Competency Statement

Given a CAD workstation, reference materials, and an existing drawing, display an object in any viewing plane according to the ability of the CAD system.

6.6 COMPETENCY: Apply color and shading to an object.

Competency Statement

Given a CAD program with color and shading capabilities, and reference materials, apply color and shading to an object to accurately reflect true colors and actual light and shadow characteristics.

6.7 COMPETENCY: Display an object in a perspective view.

Competency Statement

Given a CAD program with perspective capabilities, and reference materials, display an object in a perspective view according to assignment specifications.

7.0 PLOTTING/PRINTING

7.1 COMPETENCY: Prepare a drawing file for plotting.

Competency Statement

Given a CAD workstation, reference materials, and an existing drawing, prepare a drawing file for plotting without errors.

7.2 COMPETENCY: Plot a drawing at a variety of scales.

Competency Statement

Given a CAD workstation, reference materials, and an existing drawing, plot a drawing at a variety of scales keeping the drawing inside the edges of the plotting media.

7.3 COMPETENCY: Plot a drawing on a variety of media sizes.

Competency Statement

Given a CAD workstation, reference materials, and an existing drawing, plot a drawing on a variety of media sizes, with the entire object inside the edges of each size of the plotting media.

7.4 COMPETENCY: Plot a drawing on different media using proper pens.

Competency Statement

Given a CAD workstation, reference materials, and an existing drawing, plot a drawing on different media using proper pens without pens skipping and ink beading, smearing, or fading.

7.5 COMPETENCY: Print a drawing using a dot matrix or laser printer.

Competency Statement

Given a CAD workstation, reference materials, and an existing drawing, print a drawing using a dot matrix or laser printer so that the entire drawing is printed on a single sheet of paper.

8.0 ADVANCED CAD

8.1 COMPETENCY: Create operating system menus to allow selection of computer program.

Competency Statement

Given a CAD workstation and reference materials, create operating system menus to allow selection of computer program with each menu selection requiring a maximum of two keyboard inputs, and the program executing without errors.

8.2 COMPETENCY: Write batch files that perform specific tasks automatically.

Competency Statement

Given a CAD workstation and reference materials, write batch files that perform specific tasks automatically without errors.

8.3 COMPETENCY: Design custom macro commands to be used by a CAD system.

Competency Statement

Given a CAD workstation and reference materials, design custom macro commands to be used by a CAD system that combine the functions of two or more existing commands and functions without errors.

8.4 COMPETENCY: Create custom CAD program screen menus.

Competency Statement

Given a CAD workstation and reference materials, create custom CAD program screen menus that combine existing and custom commands and functions without errors.

8.5 COMPETENCY: Create custom digitizer tablet menus.

Competency Statement

Given a CAD workstation and reference materials, create custom digitizer tablet menus that combine existing and custom commands and functions without errors.

8.6 COMPETENCY: Arrange a group of drawings into a continuously running display on a monitor.

Competency Statement

Given a CAD workstation and reference materials, arrange a group of drawings into a continuously running display on a monitor that displays each drawing for a minimum of three seconds without errors.

8.7 COMPETENCY: Design new commands using computer programming techniques.

Competency Statement

Given a CAD workstation, reference materials, and a programming language such as Autolisp, design new commands using computer programming techniques that combine or enhance the functions of existing commands without errors.